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10/581,967	06/07/2006	Yuji Mukai	L7002.06103	7261

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EXAMINER	
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ART UNIT	PAPER NUMBER
1797	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/581,967	MUKAI ET AL.	
	Examiner	Art Unit	
	NATASHA YOUNG	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 January 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Asou et al (JP 2003-252604) in view of Komiya et al (US 2002/0042035 A1).

Regarding claim 1, Asou et al discloses a hydrogen generator (100) comprising: a mixed gas passage (18) configured to flow a mixed gas containing two or more components; first and second passages configured to branch off, at their leading ends, from the mixed gas passage and join to each other at their trailing ends (see Abstract; paragraphs 0023-0033; and figures 1-2).

Asou et al does not disclose that the first turning means formed in the first passage to turn the mixed gas flowing in the first passage in a first direction; second turning means formed in the second passage to turn the mixed gas flowing in the second passage in a second direction opposite to the first direction; and a hydrogen generating section configured to generate hydrogen by causing a chemical reaction of the mixed gas which flows out from the joined trailing ends of the first and second passages.

Komiya et al discloses that the first turning means is composed of a plurality of partition walls that turn in the first direction, helically partitioning the tubular inner space of the first passage; and wherein the second turning means is composed of a plurality of partition walls that turn in the second direction, helically partitioning the tubular inner space of the second passage (see paragraphs 0012-0014 and figure 3) such that the first turning means formed in the first passage to turn the mixed gas flowing in the first passage in a first direction; second turning means formed in the second passage to turn the mixed gas flowing in the second passage in a second direction opposite to the first direction; and a hydrogen generating section configured to generate hydrogen by

causing a chemical reaction of the mixed gas which flows out from the joined trailing ends of the first and second passages.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Asou et al with the teachings of Komiya et al for more uniform temperature distribution and mixing and the suppression of undesired side reaction (see Komiya et al paragraphs 0042-0045).

Claim 2 depends on claim 1 such that the reasoning used to reject claim 1 will be used to reject the dependent portions of the claim.

Regarding claim 2, Asou et al does not disclose that the first and second passages are formed so as to allow the mixed gas to turn in the first and second directions respectively, when flowing in planes perpendicular to the outflow direction of the mixed gas flowing out from the trailing ends of the first and second passages.

Komiya et al discloses that the first turning means is composed of a plurality of partition walls that turn in the first direction, helically partitioning the tubular inner space of the first passage; and wherein the second turning means is composed of a plurality of partition walls that turn in the second direction, helically partitioning the tubular inner space of the second passage (see paragraphs 0012-0014 and figure 3) such that the first and second passages are formed so as to allow the mixed gas to turn in the first and second directions respectively, when flowing in planes perpendicular to the outflow direction of the mixed gas flowing out from the trailing ends of the first and second passages.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Asou et al with the teachings of Komiya et al for more uniform temperature distribution and mixing and the suppression of undesired side reaction (see Komiya et al paragraphs 0042-0045).

Claim 3 depends on claim 2 such that the reasoning used to reject claim 2 will be used to reject the dependent portions of the claim.

Regarding claim 3, Asou et al does not disclose that the first and second passages have a common central axis and are hollow in shape, each having an open outer periphery and a circular opening at the center thereof, said outer periphery of each passage constituting an inlet that serves as the leading end while said opening of each passage constitutes an outlet that serves as the trailing end; wherein the first turning means is composed of a plurality of partition walls that partition the inner space of the first passage in a direction along the central axis and each partition wall extends inwardly from the outer periphery of the inner space such that its trailing end is deviated from its leading end in said first direction with respect to a radial direction; and wherein the second turning means is composed of a plurality of partition walls that partition the inner space of the second passage in a direction along the central axis and each partition wall extends inwardly from the outer periphery of the inner space such that its trailing end is deviated from its leading end in said second direction with respect to a radial direction.

Komiya et al discloses that the first turning means is composed of a plurality of partition walls that turn in the first direction, helically partitioning the tubular inner space

of the first passage; and wherein the second turning means is composed of a plurality of partition walls that turn in the second direction, helically partitioning the tubular inner space of the second passage (see paragraphs 0012-0014 and figure 3) such that the first and second passages have a common central axis and are hollow in shape, each having an open outer periphery and a circular opening at the center thereof, said outer periphery of each passage constituting an inlet that serves as the leading end while said opening of each passage constitutes an outlet that serves as the trailing end; wherein the first turning means is composed of a plurality of partition walls that partition the inner space of the first passage in a direction along the central axis and each partition wall extends inwardly from the outer periphery of the inner space such that its trailing end is deviated from its leading end in said first direction with respect to a radial direction; and wherein the second turning means is composed of a plurality of partition walls that partition the inner space of the second passage in a direction along the central axis and each partition wall extends inwardly from the outer periphery of the inner space such that its trailing end is deviated from its leading end in said second direction with respect to a radial direction.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Asou et al with the teachings of Komiya et al for more uniform temperature distribution and mixing and the suppression of undesired side reaction (see Komiya et al paragraphs 0042-0045).

Claim 4 depends on claim 3 such that the reasoning used to reject claim 3 will be used to reject the dependent portions of the claim.

Regarding claim 4, Asou et al does not disclose that the angle of deviation of the trailing end from the leading end around the central axis in each partition wall is within the range of 45 to 90 degrees.

Komiya et al discloses that the first turning means is composed of a plurality of partition walls that turn in the first direction, helically partitioning the tubular inner space of the first passage; and wherein the second turning means is composed of a plurality of partition walls that turn in the second direction, helically partitioning the tubular inner space of the second passage (see paragraphs 0012-0014 and figure 3) such that the angle of deviation of the trailing end from the leading end around the central axis in each partition wall is within the range of 45 to 90 degrees.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Asou et al with the teachings of Komiya et al for more uniform temperature distribution and mixing and the suppression of undesired side reaction (see Komiya et al paragraphs 0042-0045).

Claim 5 depends on claim 2 such that the reasoning used to reject claim 2 will be used to reject the dependent portions of the claim.

Regarding claim 5, Asou et al does not disclose that a plurality of said first and second passages and a plurality of said first and second turning means are arranged along the central axis.

Komiya et al discloses that the first turning means is composed of a plurality of partition walls that turn in the first direction, helically partitioning the tubular inner space of the first passage; and wherein the second turning means is composed of a plurality of

partition walls that turn in the second direction, helically partitioning the tubular inner space of the second passage (see paragraphs 0012-0014 and figure 3) such that a plurality of said first and second passages and a plurality of said first and second turning means are arranged along the central axis.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Asou et al with the teachings of Komiya et al for more uniform temperature distribution and mixing and the suppression of undesired side reaction (see Komiya et al paragraphs 0042-0045).

Claim 6 depends on claim 1 such that the reasoning used to reject claim 1 will be used to reject the dependent portions of the claim.

Regarding claim 6, Asou et al does not disclose that the first and second passages are formed so as to allow the mixed gas to turn in the first and second directions respectively, when flowing in cylindrical planes parallel to the outflow direction of the mixed gas flowing out from the trailing ends of the first and second passages. Komiya et al discloses that the first turning means is composed of a plurality of partition walls that turn in the first direction, helically partitioning the tubular inner space of the first passage; and wherein the second turning means is composed of a plurality of partition walls that turn in the second direction, helically partitioning the tubular inner space of the second passage (see paragraphs 0012-0014 and figure 3) such that the first and second passages are formed so as to allow the mixed gas to turn in the first and second directions respectively, when flowing in cylindrical planes parallel to the

outflow direction of the mixed gas flowing out from the trailing ends of the first and second passages.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Asou et al with the teachings of Komiya et al for more uniform temperature distribution and mixing and the suppression of undesired side reaction (see Komiya et al paragraphs 0042-0045).

Claim 7 depends on claim 6 such that the reasoning used to reject claim 6 will be used to reject the dependent portions of the claim.

Regarding claim 7, Asou et al discloses that the first and second passages have a common central axis and are respectively formed in the shape of a tube of annular section, and one end face of each passage constituting an inlet that serves as the leading end while the other end face of each passage constitutes an outlet that serves as the trailing end (see figure 1).

Asou does not disclose that the first turning means is composed of a plurality of partition walls that turn in the first direction, helically partitioning the tubular inner space of the first passage; and wherein the second turning means is composed of a plurality of partition walls that turn in the second direction, helically partitioning the tubular inner space of the second passage.

Komiya et al discloses that the first turning means is composed of a plurality of partition walls that turn in the first direction, helically partitioning the tubular inner space of the first passage; and wherein the second turning means is composed of a plurality of

partition walls that turn in the second direction, helically partitioning the tubular inner space of the second passage (see paragraphs 0012-0014 and figure 3).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Asou et al with the teachings of Komiya et al for more uniform temperature distribution and mixing and the suppression of undesired side reaction (see Komiya et al paragraphs 0042-0045).

Claim 8 depends on claim 7 such that the reasoning used to reject claim 7 will be used to reject the dependent portions of the claim.

Regarding claim 8, Asou et al does not disclose that the turning angle of each of the partition walls from its leading end to its trailing end is within the range of 45 to 90 degrees.

Komiya et al discloses that the first turning means is composed of a plurality of partition walls that turn in the first direction, helically partitioning the tubular inner space of the first passage; and wherein the second turning means is composed of a plurality of partition walls that turn in the second direction, helically partitioning the tubular inner space of the second passage (see paragraphs 0012-0014 and figure 3) such that the angle of deviation of the trailing end from the leading end around the central axis in each partition wall is within the range of 45 to 90 degrees.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Asou et al with the teachings of Komiya et al for more uniform temperature distribution and mixing and the suppression of undesired side reaction (see Komiya et al paragraphs 0042-0045).

Claim 9 depends on claim 8 such that the reasoning used to reject claim 8 will be used to reject the dependent portions of the claim.

Regarding claim 8, Asou et al does not disclose that outlets of turning passages separated by the partition walls are partially closed.

Komiya et al discloses that outlets of turning passages separated by the partition walls are partially closed (see figures 1-3).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Asou et al with the teachings of Komiya et al for more uniform temperature distribution and mixing and the suppression of undesired side reaction (see Komiya et al paragraphs 0042-0045).

Claim 10 depends on claim 9 such that the reasoning used to reject claim 9 will be used to reject the dependent portions of the claim.

Regarding claim 8, Asou et al does not disclose that the first passage and the second passage are separated from each other by a cylindrical dividing wall, the outlets of the turning passages of either the first or second passage are closed, and an opening is formed in the dividing wall at a position in the vicinity of each of the closed outlets.

Komiya et al discloses that the first passage and the second passage are separated from each other by a cylindrical dividing wall, the outlets of the turning passages of either the first or second passage are closed, and an opening is formed in the dividing wall at a position in the vicinity of each of the closed outlets (see paragraph 0012-0014 and figures 1-3).

Claim 11 depends on claim 6 such that the reasoning used to reject claim 6 will be used to reject the dependent portions of the claim.

Regarding claim 11, Asou et al does not disclose that a plurality of said first passages are arranged along the central axis such that the trailing end of a first passage located in an upstream position when viewed in the flowing direction of the mixed gas is connected to the leading end of a first passage located in a downstream position and a plurality of said second passages are arranged along the central axis such that the trailing end of a second passage located in an upstream position when viewed in the flowing direction of the mixed gas is connected to the leading end of a second passage located in a downstream position.

Komiya et al discloses that the first turning means is composed of a plurality of partition walls that turn in the first direction, helically partitioning the tubular inner space of the first passage; and wherein the second turning means is composed of a plurality of partition walls that turn in the second direction, helically partitioning the tubular inner space of the second passage (see paragraphs 0012-0014 and figure 3) such that a plurality of said first passages are arranged along the central axis such that the trailing end of a first passage located in an upstream position when viewed in the flowing direction of the mixed gas is connected to the leading end of a first passage located in a downstream position and a plurality of said second passages are arranged along the central axis such that the trailing end of a second passage located in an upstream position when viewed in the flowing direction of the mixed gas is connected to the leading end of a second passage located in a downstream position.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Asou et al with the teachings of Komiya et al for more uniform temperature distribution and mixing and the suppression of undesired side reaction (see Komiya et al paragraphs 0042-0045).

Claim 12 depends on claim 1 such that the reasoning used to reject claim 1 will be used to reject the dependent portions of the claim.

Regarding claim 12, Asou et al discloses that the mixed gas is a mixture of water and an organic compound containing at least carbon and hydrogen; the chemical reaction is a steam reforming reaction in which hydrogen is generated from the mixed gas of the organic compound and water; the hydrogen generating section is a reforming reactor section for generating a hydrogen-rich reformed gas through the steam reforming reaction (see Abstract; paragraphs 0023-0033; and figures 1-2).

Asou et al does not disclose that the first turning means and second turning means are located at positions upstream of the reforming reactor section; and wherein the mixed gas flowing out from the joined trailing ends of the first and second passages is supplied to the reforming reactor section to generate hydrogen.

Komiya et al discloses that the first turning means is composed of a plurality of partition walls that turn in the first direction, helically partitioning the tubular inner space of the first passage; and wherein the second turning means is composed of a plurality of partition walls that turn in the second direction, helically partitioning the tubular inner space of the second passage (see paragraphs 0012-0014 and figure 3) such that the first turning means and second turning means are located at positions upstream of the

reforming reactor section; and wherein the mixed gas flowing out from the joined trailing ends of the first and second passages is supplied to the reforming reactor section to generate hydrogen.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Asou et al with the teachings of Komiya et al for more uniform temperature distribution and mixing and the suppression of undesired side reaction (see Komiya et al paragraphs 0042-0045).

Claim 13 depends on claim 1 such that the reasoning used to reject claim 1 will be used to reject the dependent portions of the claim.

Regarding claim 13, Asou et al does not disclose the mixed gas is a mixture of the reformed gas and oxygen, and a selective oxidation reactor section is used in place of the hydrogen generating section, the selective oxidation reactor section reducing carbon monoxide contained in the reformed gas through a selective oxidation reaction in which carbon monoxide is converted into carbon dioxide; wherein the first turning means and second turning means are located at positions upstream of the selective oxidation reactor section; and wherein the mixed gas flowing out from the joined trailing ends of the first and second passages is supplied to the selective oxidation reactor section to reduce carbon monoxide contained in the reformed gas.

Asou et al discloses joined trailing ends and turnings means (see figure 1).

Komiya et al discloses the mixed gas is a mixture of the reformed gas and oxygen, and a selective oxidation reactor section is used in place of the hydrogen generating section, the selective oxidation reactor section reducing carbon monoxide

contained in the reformed gas through a selective oxidation reaction in which carbon monoxide is converted into carbon dioxide; wherein the first turning means and second turning means are located at positions upstream of the selective oxidation reactor section; and wherein the mixed gas flowing out from the joined trailing ends of the first and second passages is supplied to the selective oxidation reactor section to reduce carbon monoxide contained in the reformed gas (see paragraphs 0030-0052 and figure 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Asou et al with the teachings of Komiya et al to reduce the CO concentration (see paragraph 0009).

Response to Arguments

Applicant's arguments, see Response, pages 1-2, filed January 11, 2008, with respect to the rejection(s) of claim(s) 1-13 under 102(b) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Asou et al (JP 2003-252604).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATASHA YOUNG whose telephone number is (571)270-3163. The examiner can normally be reached on Mon-Thurs 7:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

NY

/Walter D. Griffin/
Supervisory Patent Examiner, Art Unit 1797